Implementation of Active Disposal Site Gas Monitoring and Control Regulations:

Lessons Learned

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Recap- Landfill Gas Regulations

- 2004- Study recommended the more stringent 27 CCR landfill gas monitoring and control closure/ postclosure standards apply to active sites.
- 2007- new regulations adopted (20917-20945).
- 2008- regulations revised to extend general compliance dates; technical guidance/BMPs prepared.
- 2009 (July)- revised processes and procedures to address large backlog in Plans.
- 2011 (April)- Implementation 90% complete

Gas Control- 27 CCR 20921(a)

The operator shall ensure landfill gas generated at the disposal site is controlled:

(1) Methane gas must not exceed 1.25% by volume within any portion of on-site structures.

(2) Methane gas migrating from the disposal site must not exceed 5% by volume at the permitted boundary.

(3) Trace gases shall be controlled to prevent adverse exposure.

Gas Monitoring- 27 CCR 20923(a)

The operator shall implement a gas monitoring and control program:

(1) The monitoring network shall be designed by a registered civil engineer or certified engineering geologist and shall ensure detection of landfill gas migrating beyond the permitted boundary and into on-site structures; and

(2) The monitoring network shall be designed to account for specific site characteristics and potential migration pathways or barriers.

Gas Monitoring (cont.)

- Monitoring and Control Program Plans (Plans) require approval by EA and CIWMB concurrence.
- Approved Plans to be fully implemented by 10/18/2009 (<20 tpd 10/18/10); extensions allowed.
- Prescriptive standards: monitoring probe location, spacing (1000’ max.), depth (to waste), construction.
- Alternatives to prescriptive standards allowed if demonstrated to meet performance requirements by design engineer or geologist.

Remediation- 27 CCR 20937

(a) When results of landfill gas monitoring indicate concentrations in excess of compliance requirements:

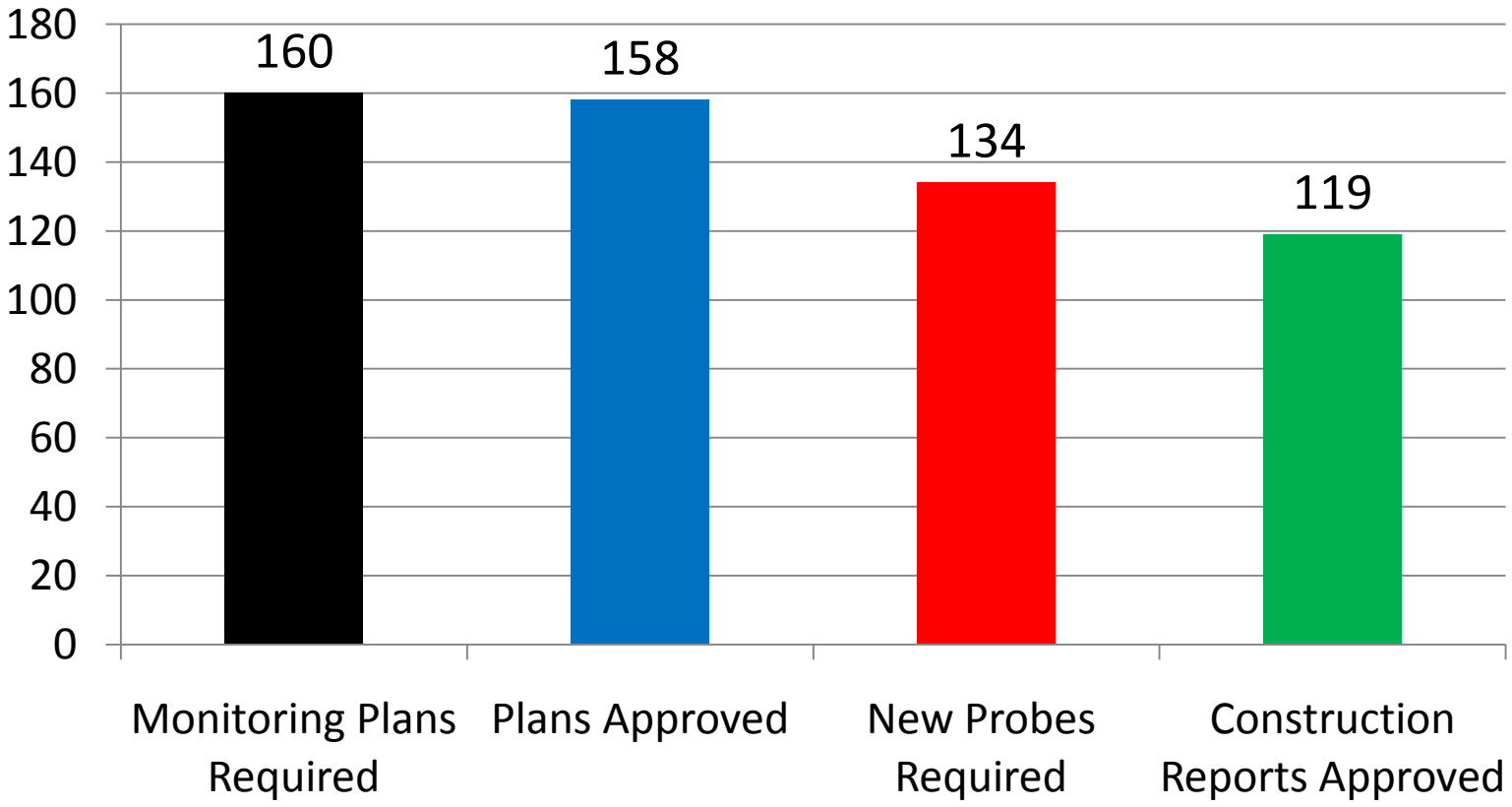
(1) Immediately take steps necessary to protect public health and safety and environment and notify EA;

(2) Within seven (7) days: (A) Verify validity of results; and (B) Place in operating record description;

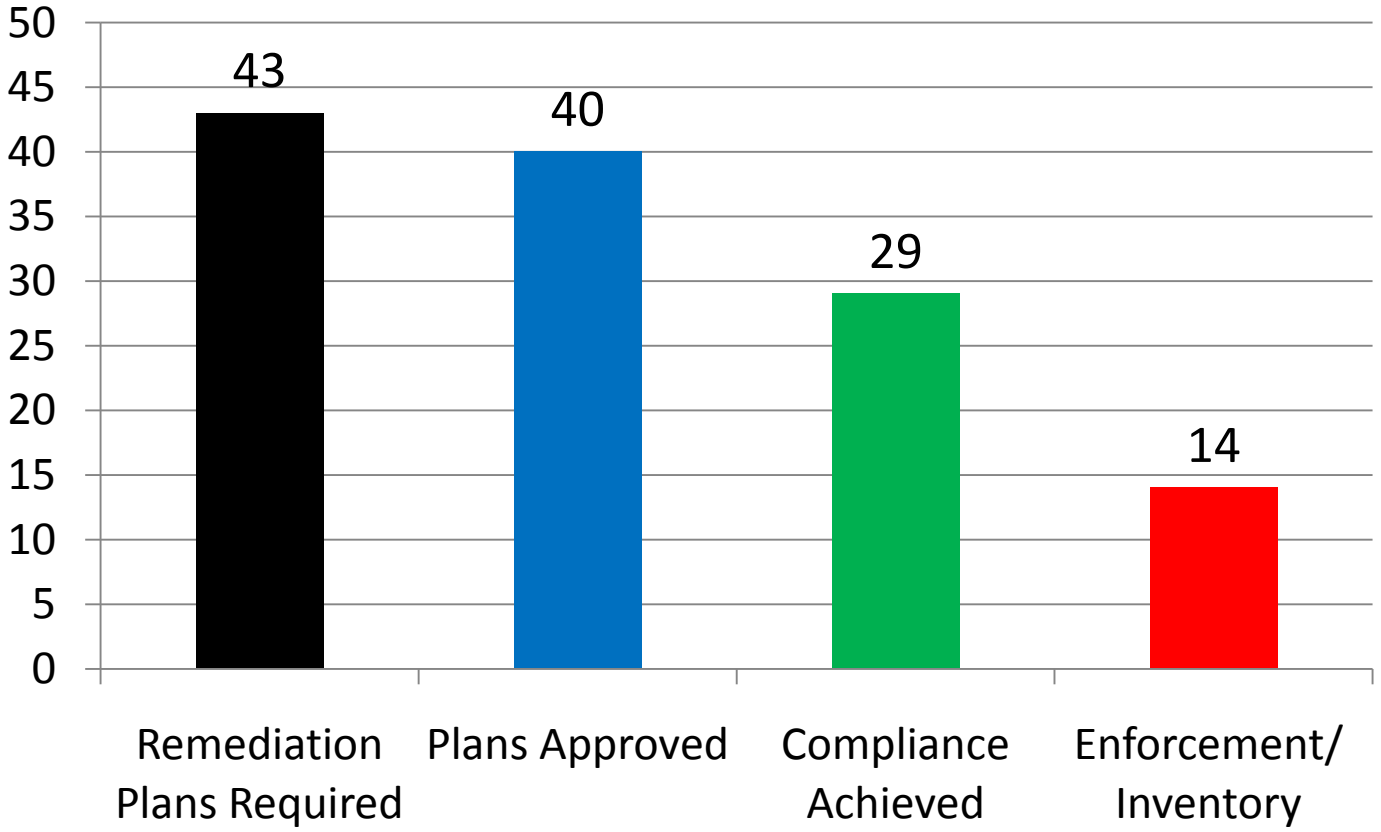
(3) Within 60 days, implement a remediation plan approved by the EA and CIWMB; and

(4) Construct gas control system designed by registered engineer, within specified time period.

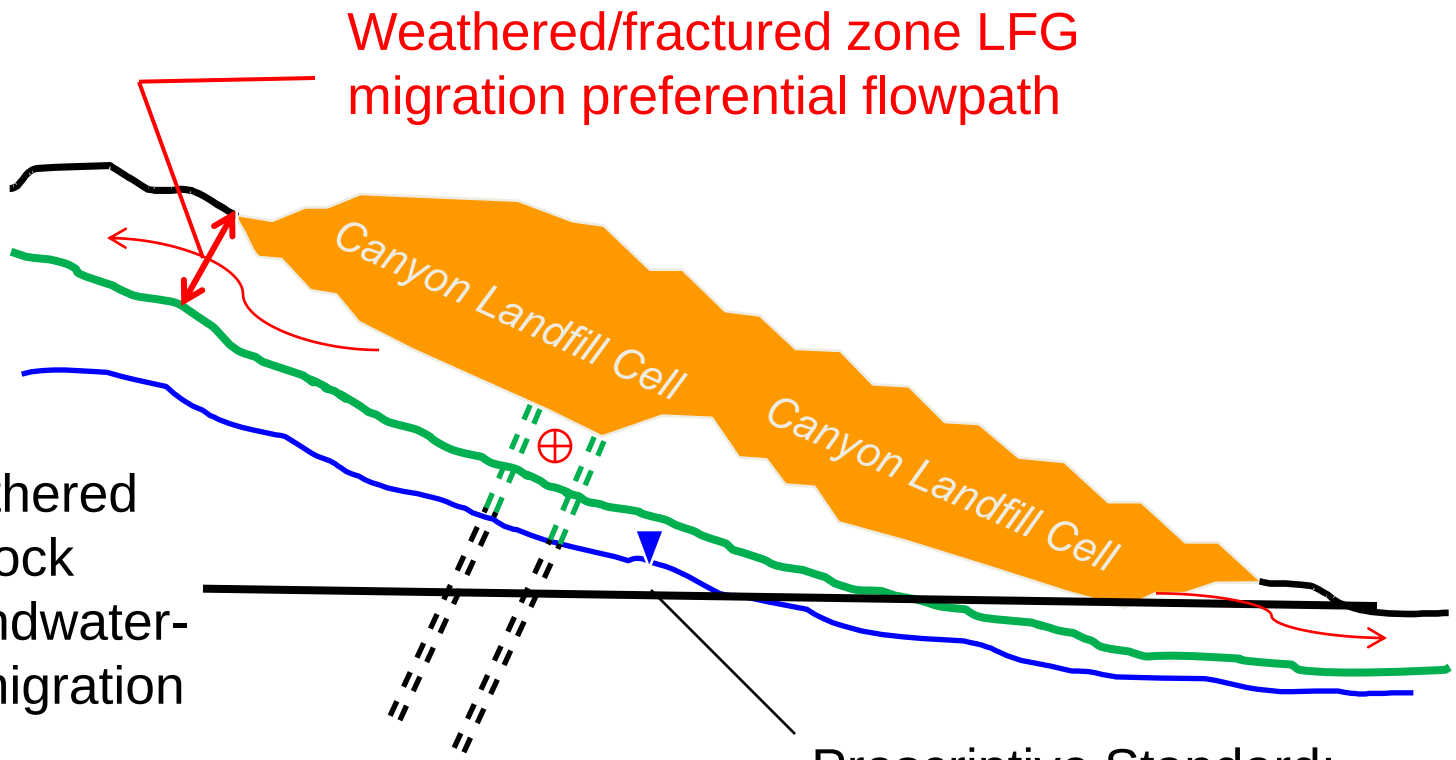
Monitoring Plan Compliance 3/11:



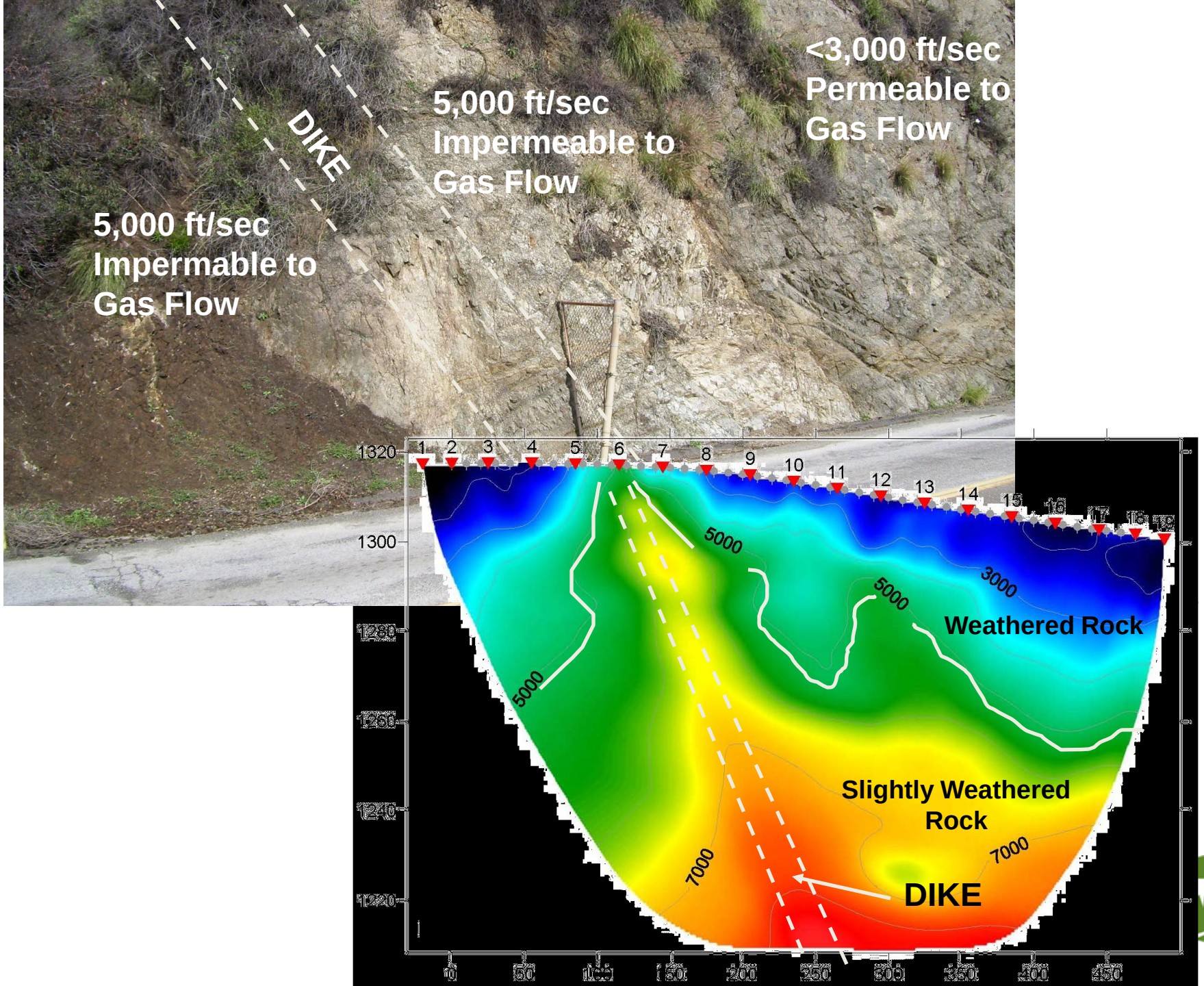
Remediation Cases From New Probes

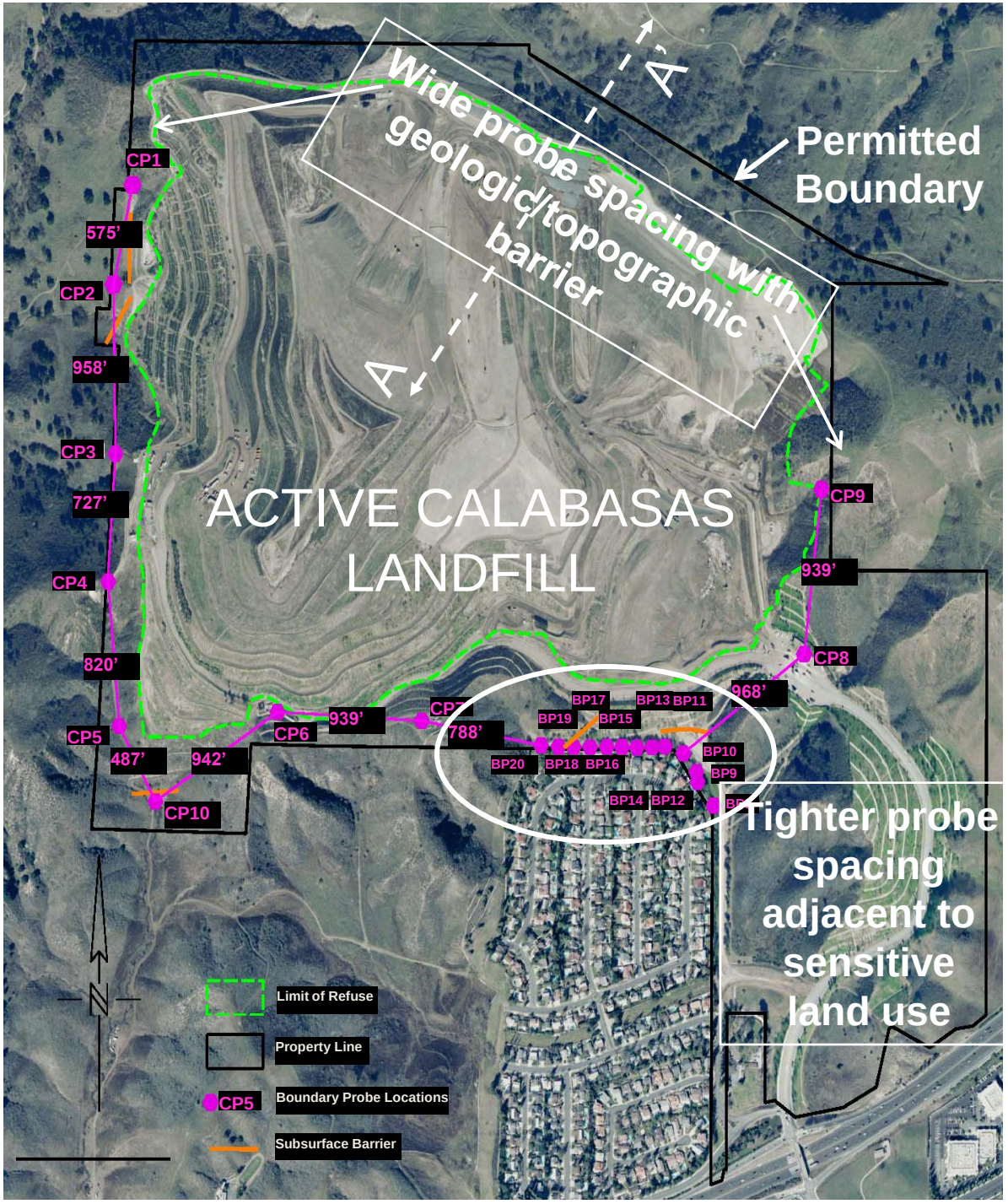


Lesson Learned: Alternative Probe Networks Based on Site-Specific Geology and Land Use

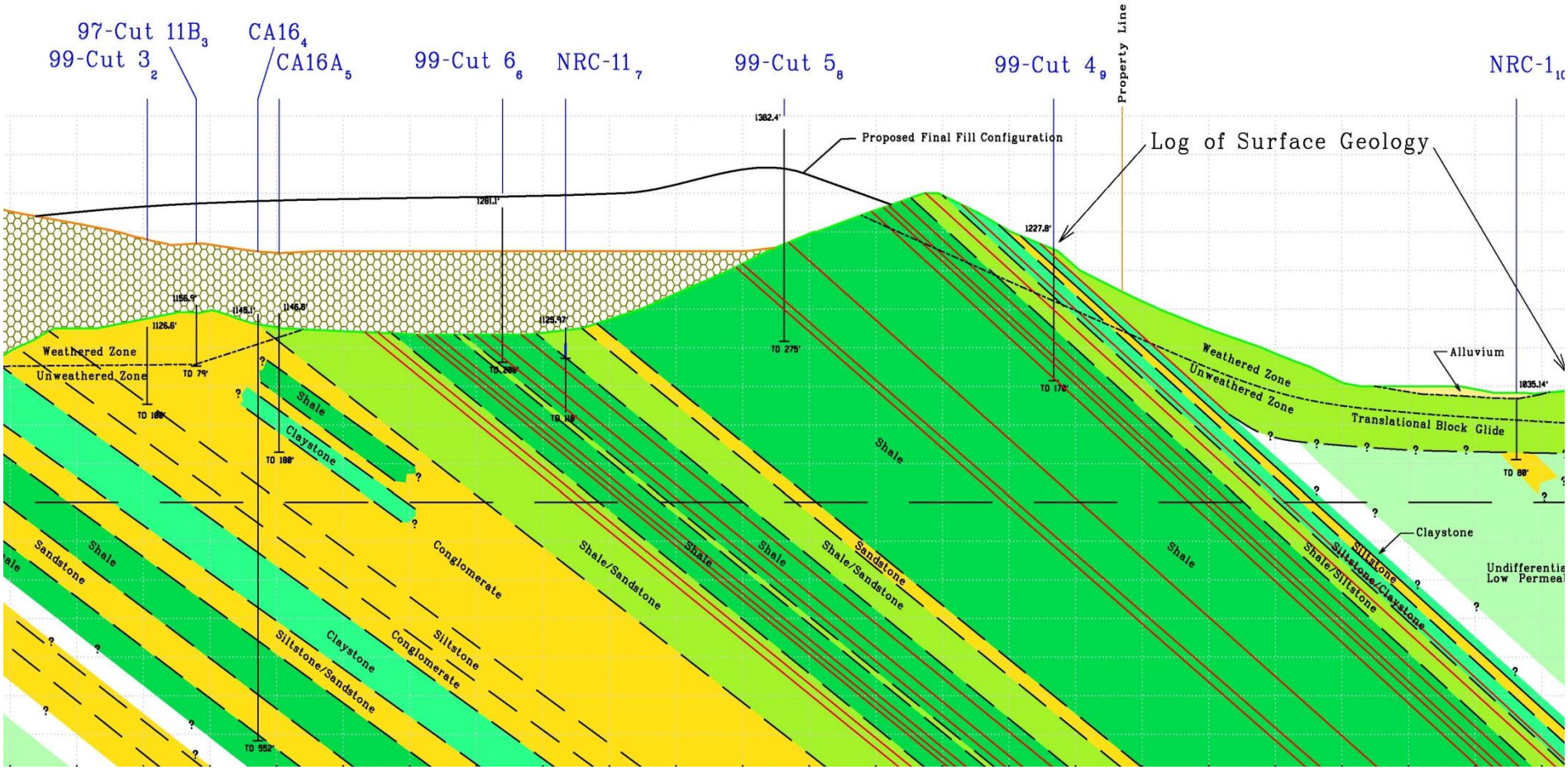



Northeast
BP 12
BP 11
BP 13
BP 10
BP 9
BP 8
BP 14
1440 ft msl
ACTIVE SCHOLL
CANYON LANDFILL
BP7
BP6
BP 15
1410 ft msl
BP 16
BP5
3500 ft
1550 ft msl
980 ft msl
INACTIVE SCHOLL
CANYON LANDILL
BP1-BP4


DIKE
5,000 ft/sec
Impermeable to
Gas Flow
<3,000 ft/sec
Permeable to
Gas Flow
5,000 ft/sec
Impermable to
Gas Flow
1320
1300
1280
1260
1240
1220
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
5000
5000
5000
3000
Weathered Rock
Slightly Weathered
Rock
7000
7000
DIKE
0 50 100 150 200 250 300 350 400 450


Wide probe spacing with geologic/topographic barrier
A
A
Permitted Boundary
ACTIVE CALABASAS LANDFILL
CP1
575’
CP2
958’
CP3
727’
CP4
820’
CP5
487’
942’
CP10
CP6
939’
CP7
788’
BP17
BP13 BP11
BP19
BP15
BP20
BP18 BP16
BP10
BP9
BP14 BP12
968’
CP8
939’
CP9
Tighter probe spacing adjacent to sensitive land use
Limit of Refuse
Property Line
CP5
Boundary Probe Locations
Subsurface Barrier

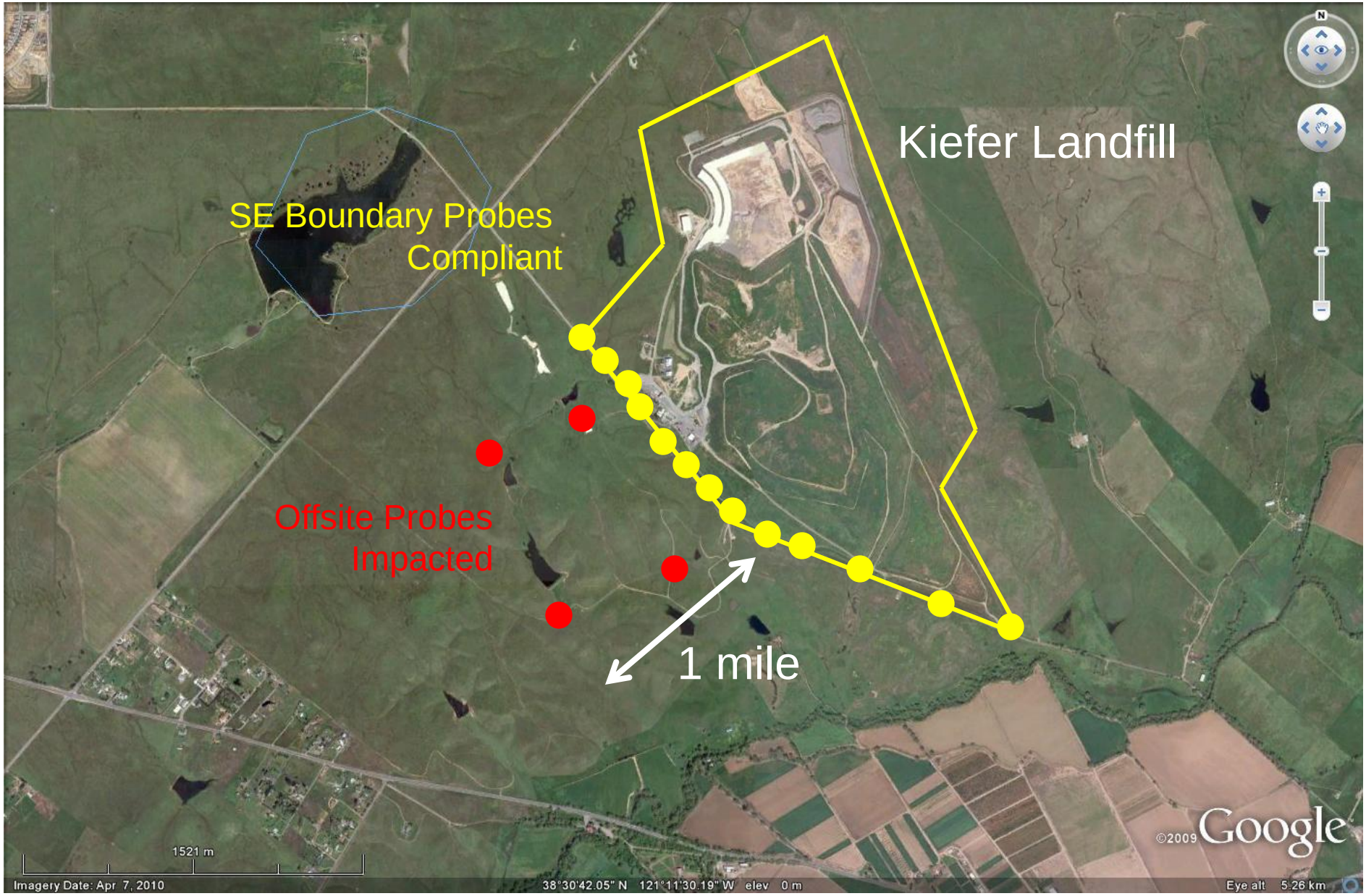
Section A-A’


97-Cut 11B3
99-Cut 32
CA164
CA16A5
99-Cut 66
NRC-117
99-Cut 58
99-Cut 49
Property Line
NRC-110
Proposed Final Fill Configuration
Log of Surface Geology
Weathered Zone
Unweathered Zone
Alluvium
Translational Block Glide
Shale
Claystone
Sandstone
Conglomerate
Shale/Sandstone
Siltstone
Siltstone/Sandstone
Shale/Siltstone
Siltstone/Claystone
Undifferentia
Low Permea

Lessons Learned- Remediation

- Probes typically deeper, closer to waste footprint, and/ or tighter spacing resulted in new violations at *1/3 of facilities*.
- No inhabitable structures impacted.
- Most impacted sites have existing gas collection and control systems. Typical remediation approaches:
  - Inspect, repair, and adjust (optimize) existing system.
  - Replace compliance probes further from waste footprint.
  - Expand infill collection capacity (new wells and piping).
- Special cases: new systems; perimeter/SVE systems; thermogenic (i.e. non-landfill) gas; older “stranded” gas.

Lessons Learned- “Stranded Gas”



Lessons Learned- Implementation

- What didn't work:
  - Level of effort to implement was greatly underestimated and not adequately addressed during the rulemaking process.
  - Lack of site-specific flexibility resulted in impasse with operators.
- What worked: *Adjustments in July 2009:*
  - Business practices; sharepoint tracking system; enforcement guidance; extension request and dispute resolution processes.
  - Core multi-Branch group of motivated Supervisors and technical expertise in responsible charge.
  - Proactive, facilitative, results oriented negotiation with operators rather than traditional command and control.

Active Disposal Site Gas Monitoring and Control Regulations: Follow-up

- Future workshop(s) to:
  - Share benefit of statewide technical knowledge gained with LEAs, agencies, and stakeholders.
  - Areas of further discussion:
    1. Identification and remediation of older weathered or "stranded" gas cases. Are enhanced and monitored natural attenuation approaches viable?
    2. Thermogenic gas and mixtures; methods for testing.
    3. Probe purging protocols, effectiveness evaluations.
    4. Extraction well vacuum influence on probes.
    5. Agency overlap and coordination (e.g., ARB, SCAQMD).

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Questions?

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